

Application No. 10/056,434
Response to Office Action of October 14, 2003

REMARKS

In the Office Action mailed on October 14, 2003 by the United States Patent and Trademark Office, the Examiner rejected claims 1-26. Claim 1 has been amended. Applicant respectfully requests reconsideration in light of the foregoing amendments and the following remarks. The foregoing amendments and the following remarks are believed to be fully responsive to the Office Action mailed on October 14, 2003 and no new matter has been added.

I. Rejections Under 35 U.S.C. 102(b)

Claims 1-26 stand rejected under 35 U.S.C. 102(b) as anticipated by the Ph.D. Thesis by Kuchar ("*Kuchar*").

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test, i.e., identity of terminology is not required. In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990). MPEP 2131.

The Examiner argues that *Kuchar* anticipates all pending claims. Before evaluating the merits of that assertion, it is important to recognize that while some of the terminology used by *Kuchar* is similar to that in the present invention, *Kuchar's* thesis discusses techniques to perform beam forming and does not provide much detail on the structures needed to implement the invention. Indeed, *Kuchar* fails to disclose each and every element concerning the structures in the apparatus claims 1-14 of the present invention. Therefore, the rejection of claims 1-14 under 35 U.S.C. 102(b) should be withdrawn.

The Examiner rejects claim 1, stating that *Kuchar* discloses all of the limitations of claim 1, except for calculating the phase difference. However, the Examiner argues that the calculation of phase difference is inherent in the ESPRIT DOA algorithm, and provides U.S.

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Patent No. 4,750,147 issued to Roy (*Roy*) as support. However, *Kuchar* fails to teach or disclose several limitations of claim 1, as amended.

Kuchar fails to disclose "a difference calculator coupled to the ray selector". The Examiner argues that a difference calculator is shown in section 4.6.2 of *Kuchar*. However, that section of *Kuchar* simply discusses how *Kuchar's* method selects the DOA for beam forming. Nowhere in this section is a difference calculator coupled to a ray selector disclosed or taught. *Kuchar* simply lacks this structure.

Kuchar also fails to disclose a difference calculator "configured to determine an amplitude difference and a phase difference between said first ray and said second ray". Again, the Examiner indicates that this limitation can be found in section 4.6.2. However, that section discusses how *Kuchar* chooses a DOA based on the signal having the single strongest multipath. There is no discussion of determining an amplitude difference or a phase difference between two rays in section 4.6.2 of *Kuchar*. Indeed, an amplitude difference is not even used in the DOA calculation of *Kuchar*. In the DOA algorithm of *Kuchar* (the ESPRIT algorithm) it is assumed that the only difference in the signals received at the sensors is a phase shift caused by the DOA. *Kuchar*, page 33.

Further, *Kuchar* fails to disclose, teach or suggest "an angle estimator coupled to the difference calculator". The Examiner argues that sections 4.3 and 4.6.2 show this limitation. However, section 4.3 discusses how *Kuchar* estimates the DOA; specifically, *Kuchar* discusses the use of the ESPRIT algorithm. What is not shown is an angle estimator coupled to the difference calculator. Section 4.6.2, as discussed previously, discusses choosing a DOA based on the single strongest multipath. Section 4.6.2 does not disclose, teach or suggest "an angle estimator coupled to the difference calculator". These sections of *Kuchar* fail to disclose this structure.

Kuchar also fails to disclose, teach or suggest calculating a "plurality of DOA values based at least part upon the phase difference and select one of said plurality of selection of DOA values utilizing said amplitude difference". *Kuchar* discloses selecting DOA values based on the single strongest multipath and not based on amplitude differences. Indeed, as discussed previously, the algorithm of *Kuchar* does not utilize the amplitude difference but assumes the only variation in received signals is in the phase difference.

For at least the reasons discussed above, claim 1 is allowable.

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Considering claim 8, *Kuchar* fails to disclose, teach or suggest "a first magnitude calculator" or "a second magnitude calculator". Nowhere in *Kuchar* is a magnitude calculator disclosed, nor does the Examiner explain where such a structure is disclosed.

The Examiner also rejects claims 8-10 for the same reason as claim 1. Claims 8-10 depend from allowable claim 1. Therefore, claims 8-10 are allowable.

Considering claim 15, claim 15 recites the limitation of "determining an amplitude difference and a phase difference between said first ray and said second ray". As discussed previously, *Kuchar*, at the very least, does not disclose, teach or suggest defining an amplitude difference as in claim 15.

Additionally, claim 15 includes the limitation of "selecting one of said plurality DOA values utilizing said amplitude difference". As discussed previously, *Kuchar* selects DOA values based on the strongest multipath DOA and not using an amplitude difference. Therefore, *Kuchar* does not disclose, teach or suggest this limitation.

For at least these reasons, claim 15 is allowable.

The Examiner rejects claims 20-22 for the same reason as the rejection of claim 15. Claims 20-22 depend from allowable claim 15. Therefore, claims 20-22 are in condition for allowance.

The Examiner argues that *Kuchar* discloses the limitation of claim 2 of "a separation distance between said first antenna and said second antenna is greater than one-half of the wavelength of said RF signal" because *Kuchar* says in a footnote that a general antenna can be used and because one of ordinary skill in the art would recognize that if you start with an area of antennas and move them around a little bit some will end up being spaced less than a wavelength apart and some will be spaced more than a wavelength apart. This argument is flawed for several reasons.

First, the footnote in *Kuchar* states that the *Kuchar* definition of "array", when talking in general about smart antennas, includes antenna structures with elements of any spacing. However, *Kuchar* actually uses a uniform linear array with element spacing of half a wavelength. *Kuchar*, page 16, lines 11-13. Note that *Kuchar* never states that his methods would be applicable to a general antenna or any other arrangement of antenna elements aside from the ones disclosed in the thesis. Even if the examiner was correct, nothing in *Kuchar*

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would teach or suggest to one skilled in the art how to modify *Kuchar* to work with a general antenna arrangement.

Further, the use of the ESPRIT DOA technique requires equally spaced pairs of antenna elements. See *Roy*, column 5, lines 28-37 and *Kuchar*, page 33. Therefore, one can not simply take what is disclosed in *Kuchar*, namely the ESPRIT algorithm and start moving elements around leaving some elements at greater than a wavelength apart and some less than a wavelength apart without rendering the teachings of *Kuchar* inoperable.

Therefore, for at least these reasons, claim 2 is allowable.

Claim 16 includes limitations similar to the limitations of Claim 2. For the reasons discussed in conjunction with Claim 2, claim 16 is also allowable.

Claims 3-4, 5, 6, 17 and 18 depend from allowable claim 1 or claim 15. Therefore, claims 3-6, and 17-18 are allowable.

In regards to claim 7 and 19, the examiner argues that *Kuchar* discloses the first and second rays are prompt rays in section 4.6.2, second paragraph. However, as discussed previously, this section discusses choosing a DOA based on the signal with the strongest multipath component. Nothing in that section discuss prompt rays. Additionally, as known in the art, prompt rays may not always be the strongest received rays, especially in urban areas with non-line of sight cellular fading scenarios. Therefore, claims 17 and 19 are allowable.

The Examiner rejects claims 11-14 and 23-26 by asserting *Kuchar* discloses phase calibration. However, the structures and methods used to calculate the phase calibration in the present invention differ from the *Kuchar* disclosure.

Claim 11 recites, in part, "a phase calibration computer that is configured to receive said first DOA estimate and directivity data of said first antenna and said second antenna and compute a phase calibration". No where in *Kuchar* is there shown a structure of resembling a phase calibration computer. Further, *Kuchar* fails to disclose, teach or suggest calculating a phase calibration using directivity data of the antenna. Therefore, *Kuchar* fails to anticipate all of the limitations of claim 11. Claim 11 is, therefore, in condition for allowance.

Claim 12 recites, in part, "said angle estimator comprises a phase difference calibrator that is configured to receive said phase calibration and said phase difference and compute a calibrated phase difference". No where in *Kuchar* is there shown a structure of resembling a

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phase difference calibrator. Further, *Kuchar* fails to disclose, teach or suggest computing a calibrated phase difference, much less calculating a calibrated phase difference using a phase difference and a phase calibration. Therefore, *Kuchar* fails to anticipate all of the limitations of claim 12. Claim 12 is, therefore, in condition for allowance.

Claim 13 recites, in part "an ambiguous DOA solution generator that is configured to receive said calibrated phase difference and geometry data of said first antenna and said second antenna and calculate said plurality of DOA values". No where in *Kuchar* is there shown an ambiguous DOA solution generator. Further, since the ESPRIT algorithm requires half-wavelength spacing, ambiguous solutions will not be generated. Thus, *Kuchar* has no use for an ambiguous DOA solution generator. Therefore, *Kuchar* fails to anticipate all of the limitations of claim 13. Claim 13 is in condition for allowance.

Claim 14 recites, in part, "a final DOA estimator that is configured to receive said plurality of DOA values and said first DOA estimate, said final DOA estimator selecting one of said second plurality of DOA values utilizing a comparison between said plurality DOA values and said first DOA estimate". No where in *Kuchar* is there shown a structure of resembling a final DOA estimator. Further, *Kuchar* fails to disclose, teach or suggest comparing a plurality DOA values and a first DOA estimate to find a final DOA. Indeed, as discussed previously, *Kuchar* discloses choosing a DOA based on the strongest multipath DOA. Therefore, *Kuchar* fails to anticipate all of the limitations of claim 14. Claim 14 is in condition for allowance.

Claims 23-26 have similar limitations as claims 11-14. For at least the reasons discussed above, claims 23-26 are allowable.

Further claims 11-14 depend from allowable claim 1 and claims 22-26 depend from allowable claim 15. Therefore, for at least this reason, claims 11-14 and 22-26 are allowable.

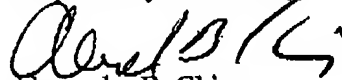
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II. CONCLUSION

Applicant respectfully submits that the above-identified application as amended is now in condition for allowance and the Applicants therefore earnestly request such allowance. Should the Examiner have any questions or wish to discuss the foregoing response and amendment, Applicants request that the Examiner contact the undersigned at (480) 385-5060.

If for some reason Applicants have not requested a sufficient extension and/or have not paid a sufficient fee for this response and/or for the extension necessary to prevent abandonment of this application, please consider this as a request for an extension for the required time period and/or authorization to charge Deposit Account No. 50-2091 for any fee which may be due.

Respectfully submitted,



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